"The first man on the street" - tracing a famous Hilbert quote (1900) back to Gergonne (1825)

Elsevier Editorial System(tm) for Historia Mathematica

Manuscript Draft

Manuscript Number: HM-16-12R1

Title: "The first man on the street" - tracing a famous Hilbert quote (1900) back to Gergonne (1825)

Article Type: Regular Article

Keywords: Hilbert's ICM talk on mathematical problems; Gergonne; HJS Smith

Corresponding Author: Prof. June Barrow-Green,

Corresponding Author's Institution: The Open University

First Author: June Barrow-Green

Order of Authors: June Barrow-Green; June Barrow-Green; Reinhard Siegmund-Schultze

Abstract: A short, catchy, and in its content somewhat exaggerated, quote allows us to draw a connection through three-quarters of a century between two leaders of mathematics who apparently held somewhat similar philosophical, pedagogical, and political views. In addition to providing some new facets to the biographies of Gergonne and Hilbert, our article relates to increasing demands for the dissemination of mathematical knowledge and to corresponding structural changes within mathematics during the 19th century.

*Title Page

"The first man on the street" - tracing a famous Hilbert quote (1900) back to Gergonne (1825)

*June Barrow-Green,
Faculty of Science, Technology, Engineering and Mathematics,
The Open University,
Milton Keynes,
MK7 6AA,
UK.
E-mail address: june.barrow-green@open.ac.uk
*Corresponding author

Reinhard Siegmund-Schultze,
University of Agder,
Faculty of Engineering and Science,
Gimlemoen 25a, Postboks 422,
4604 Kristiansand S,
Norway.
E-mail address: reinhard.siegmund-schultze@uia.no

Acknowledgements

The authors are very grateful to Catherine Goldstein and the referees for useful and insightful comments on our manuscript, and to Karine Chemla for sharing with us her unpublished manuscript on Chasles.

"The first man on the street" - tracing a famous Hilbert quote (1900) back to Gergonne (1825)

Abstract

A short, catchy, and in its content somewhat exaggerated, quote allows us to draw a connection through three-quarters of a century between two leaders of mathematics who apparently held somewhat similar philosophical, pedagogical, and political views. In addition to providing some new facets to the biographies of Gergonne and Hilbert, our article relates to increasing demands for the dissemination of mathematical knowledge and to corresponding structural changes within mathematics during the 19th century.

Zusammenfassung

Ein kurzes, prägnantes und in seiner Aussage etwas übertreibendes Zitat erlaubt es uns, eine Verbindungslinie durch ein Dreivierteljahrhundert zwischen zwei führenden Mathematikern zu ziehen, die anscheinend verwandte philosophische, pädagogische und politische Ansichten vertraten. Indem wir den Biographien von Gergonne und Hilbert einige neue Facetten hinzugefügen, deuten wir zugleich auf die während des 19. Jahrhunderts zunehmenden Anforderungen an die Verbreitung mathematischen Wissens und auf damit einhergehende strukturelle Änderungen in der Mathematik selbst hin.

MSC: 01A55; 01A80

Keywords: Hilbert's ICM talk on mathematical problems; Gergonne; HJS Smith

In his influential talk at the International Congress of Mathematicians in Paris on "Mathematical Problems", David Hilbert remarked on August 8, 1900:

> An old French mathematician said: 'A mathematical theory is not to be considered complete until you have made it so clear that you can explain it to the first man whom you meet on the street.'[1]

[1] Hilbert (2000, 407). The complete paragraph in the original German publication of 1900 is as follows: "Ein alter französischer Mathematiker hat gesagt: Eine mathematische Theorie ist nicht eher als vollkommen anzusehen, als bis du sie so klar gemacht hast, daß du sie dem ersten Manne erklären könntest, den du auf der Straße triffst. Diese Klarheit und leichte Faßlichkeit, wie sie hier so drastisch für eine mathematische Theorie verlangt wird, möchte ich viel mehr von einem mathematischen Problem fordern, wenn dasselbe vollkommen sein soll; denn das Klare und leicht Faßliche zieht uns an, das Verwickelte schreckt uns ab." (Hilbert, 1900, 254).

In recent years, several historical works have dealt with Hilbert's famous talk, in particular in connection with its centenary in 2000 and the establishment of the Clay Millennium Prize Problems.[2] To our knowledge, only two writers of recent works have commented on the origin of Hilbert's indirect quote, in particular on the name of the "old French mathematician" and both suggest that it might be Hermite.[3] Without alluding to Hilbert's talk, Eric Temple Bell (1883-1960), the producer of entertaining and not always reliable anecdotes from the history of mathematics, ascribes the "first man on the street" quote to Lagrange.[4]

Did Hilbert himself, when he made his nod to his hosts in Paris, know the name of the "old French mathematician"?

In our search for Hilbert's source, we turned to Robert Edouard Moritz's (1868–1940) *Memorabilia Mathematica* (1914), a useful and rather reliable collection of quotes by mathematicians on various topics relating to their profession. Throughout his book and in particular in the chapter "The Study and Research in Mathematics," the German-born American mathematician and astronomer Moritz quotes extensively from Hilbert's 1900 talk, using the 1902 English translation from the *Bulletin of the American Mathematical Society* (Hilbert, 2000). Several of these quotes from Hilbert refer to the need for clarity in the presentation of mathematical problems. The following is listed as no. 629 in Moritz's book:

> A mathematical problem should be difficult in order to entice us, yet not completely inaccessible, lest it mock at our efforts. It should be to us a guide post on the mazy paths to hidden truths, and ultimately a reminder of our pleasure in the successful solution. (Moritz, 1914, 93–94)

The quote is taken directly from the paragraph in Hilbert's talk which immediately follows the one containing the "First man on the street" quote. But the latter does not appear in Moritz's *Memorabilia* in connection with Hilbert. However, it does appear a couple of pages later, as no. 637. The linguistic differences to Hilbert's quote in the *BAMS* are minimal, but they are there:

The nature of the quote is such that it would fit well into a discussion of the broader role of fundamental science in an age of nation states, but that is not a discussion we shall enter into here.

[2] See (Grattan-Guinness, 2000; Gray, 2000; Yandell, 2002; Thiele, 2005). For a description and discussion of the Millennium Prize Problems, see (Carlson, Jaffe, Wiles, 2006).

[3] Thiele (2005, 264) and Rowe (2015, 215) say "probably Hermite" and "perhaps Hermite" respectively, both of which are probably wrong, as we shall argue below. Charles Hermite (1822–1901) was the Honorary President of the Congress in Paris in 1900.

[4] This is in the introduction to his *Men of Mathematics* (Bell, 1937, 19). However, Bell, like Hilbert, uses the adjective "first," which, as we shall see, is significant for attributing the source of Hilbert's indirect quote.

> An old French geometer used to say that a mathematical theory was never to be considered complete till you had made it so clear that you could explain it to the first man you met in the street. (Moritz, 1914, 97)

Moritz gives the author of this quote, but not the name of the "old French geometer": "SMITH, H. J. S. Nature, Vol. 8 (1873), p. 452." From this it was easy to identify the quote as coming from an address which the leading English number theorist and geometer Henry Smith (1826-1883) gave in his role as President of the Mathematical and Physical Section of the British Association for the Advancement of Science (BAAS) at its meeting in Bradford on September 18, 1873. In his address Smith focused attention on the ways in which the BAAS meetings contributed to the advancement of science, one being the "improvement and extension of scientific education".[5]

From a mathematical point of view, the Bradford meeting was also notable for the presence of Felix Klein (who had been invited by Smith), and for the amount of geometry in the programme.[6] As well as appearing in *Nature*, Smith's address was published in the 1873 *Annual Report of the British Association* (1874, 1–8), and twenty years later in volume II of Smith's *Collected Mathematical Papers* of 1894 (Smith, 1873).

The wording of the quote, in particular the allusion to the "old French mathematician/geometer" and the formulation "first man in the street," convinced us that this must have been the source of the quote in Hilbert's 1900 talk, and that the small differences in the wording result from the translations into German and back into English. To confirm this idea, we now sought to discover how Hilbert may have come across Smith's address.

We knew that Smith's mathematical interests were not remote from those of Hilbert. Hilbert quotes Smith in his *Zahlbericht* of 1897, showing that he had access to Smith's *Collected Mathematical Papers*.[7] We also knew that Hilbert had help in preparing his Paris talk from his close friend Hermann Minkowski (1864–1909) since it is detailed in their

[5] In particular, Smith referred to a BAAS committee formed (in 1869) to look into the teaching of geometry, members of which included Cayley, Clifford, Hirst, Smith, Salmon and Sylvester. He also noted that "The action of this section [Section A of the BAAS], led to the formation of an Association for the improvement of geometrical teaching [in 1871]", now known as the AIGT and the forerunner of the Mathematical Association of Great Britain.

[6] Smith also invited Charles Hermite to the meeting but evidence of his presence there has so far proved elusive. Hermite, who had recently proved the transcendence of *e*, did however contribute a paper which was read by J.W.L. Glaisher (*Leeds Mercury*, 22 September 1873, 2). The paper was on the irrationality of *e*, which would seem to imply that he thought his transcendence result too advanced for a BAAS audience (Hannabuss 2000, 212). In fact, such was the overall mathematical content of the meeting that the physicist Oliver Lodge was led to describe it as a "mathematical orgy" (Crilly, 2006, 322). It is also worth noting that it was the meeting where Clerk Maxwell delivered his famous lecture on "Molecules" (Petzold 2005).

[7] Hilbert refers in it to Smith's "Report on the theory of numbers," (1859-1865) which he quotes from Smith's *Collected Mathematical Papers* of 1894.

correspondence (Minkowski, 1973).[8] Although there is no mention in the correspondence of the "first man on the street", or indeed of Smith's Bradford address, the correspondence does contain a reference to Smith's presidential address to the London Mathematical Society: "On the Present State and Prospects of Some Branches of Pure Mathematics" (Smith, 1876) . In a letter dated 5 January 1900, Minkowski advised Hilbert to read it (Minkowski, 1973, 120) and referred to the republication of Smith's address in the latter's *Collected Mathematical Papers*.

There is no explicit evidence that Hilbert in his 1900 talk used Smith's 1876 address. Hilbert's talk reflected the considerable progress of mathematics in recent decades, and Hilbert's own aim was to present problems as stimulating the future developments in mathematics.[9] However, it is highly probable that after having been advised by Minkowski to read Smith, Hilbert when browsing the second volume of Smith's *Collected Mathematical Papers* for the 1876 address found the 1873 Bradford address as well.

Looking at Smith's 1873 address in another source, *The Leeds Mercury*, a local newspaper which reported extensively on the Bradford meeting, we find the address not only reproduced in full but embellished with reactions from the audience, including "(Laughter, and hear, hear)." immediately after the "first man met in the street".[10] Smith himself then remarked, maybe in order to comfort the incredulous non-mathematicians in the crowd: "This is of course a brilliant exaggeration." (Smith, 1873, 689). Hilbert in his 1900 talk also seems to echo this remark when he adds to the quote which we gave in the introduction:

> This clearness and ease of comprehension, here insisted on for a mathematical theory, I should still more demand for a mathematical problem if it is to be perfect; for what is clear and easily comprehended attracts, the complicated repels us.[11]

[8] Minkowski's name is also linked with that of Smith in connection with the unhappy competition for the 1883 Grand Prix of the Paris Academy of Sciences. In 1881 the Academy had asked for the formula for the number of ways of expressing an integer as the sum of five squares, but as the Academy was to discover, Smith had published a solution to the problem several years earlier. In the end the prize was awarded jointly to Smith and Minkowski, although Smith died shortly before the results were announced. This episode is well described in (Hannabuss, 2000, 214-216).

[9] The differences concern both content and wording. Smith (1876) discusses mainly trends and theories ("branches"), of which unsolved problems form but a small part. He considers Riemann's work on prime number distribution of 1859 still as "the only investigation of the asymptotic frequency of the primes which can be regarded as rigorous." (178). And he regards it "a little mortifying to the pride which mathematicians naturally feel in the advance of their science to find that no progress should have been made for one hundred years and more toward answering the … question which still remains to be answered with regard to the quadrature and rectification of the circle." (182/83) Twenty-four years later and reflecting on the 1882 result of his teacher F. Lindemann, Hilbert can of course report about the transcendence of π and on much progress in prime number theory, confirming, however, the still unsolved state of the Riemann conjecture. While Smith still speaks about the "geometry of situation", Hilbert uses as a matter of course "topology," and modern notions such as "groups" (Gruppen) and "fields" (Körper).

[10] *The Leeds Mercury*, 19 September 1873, p.2.

[11] (Hilbert, 2000, 407). For the original German text, see footnote 1.

Indeed it was the clearly formulated *problems* and not the often necessarily more complicated *theories* which were the focus of Hilbert's 1900 talk. In the German original his scepticism with respect to presenting mathematical theories in a simple way is even more clearly articulated than in the English translation. In the German original Hilbert says with somewhat of a critical undertone "drastisch … verlangt" ("drastically demands"), while the translation just says "insisted". Also, the German words behind "still more" are "viel mehr," which literally mean "much more" and have — in the German language — gradually taken the meaning of "rather", particularly when written (which, however, is not the case here) as one word "vielmehr".

We now had good evidence for Hilbert's source of the quote, but we still had not made much progress in our search for the original source, i.e. for "the old French mathematician/geometer."

We recalled that Moritz in his *Memorabilia* had repeatedly used as a source a famous French collection of mathematicians' quotes. Would the French mathematician Alphonse Rebière (1842-1901), well-known from his pioneering book *Les femmes dans la science* (1897), give us a clue about his compatriot, "the old French mathematician"? We consulted Rebière's *Mathématiques et mathématiciens: pensées et curiosités* of 1889 and there we found an "old French mathematician":

> Chasles exaggerates a little when he affirms in his Aperçu historique that one cannot flatter oneself that one has clarified and satisfactorily reduced a theory when one cannot explain it in a few words to a passerby in the street.[12]

Rebière also finds – like Smith before him and Hilbert after him – that the old French mathematician "exaggerates a little." Rebière had led us to the famous book by the projective geometer Michel de Chasles (1793–1880) *Aperçu historique sur l'origine et le développement des méthodes en géométrie* of 1837.[13]

The quote was not difficult to find in the *Aperçu.* However, there was a surprise: Rebière had made a mistake, Chasles ascribes the quote to somebody else (Chasles, 1837,

[12] "Chasles exagère un peu, lorsqu'il affirme, dans son Aperçu historique, qu'on ne peut se flatter d'avoir éclairé et réduit convenablement une théorie, tant qu'on ne peut pas l'expliquer en peu de mots à un passant dans la rue." (Rebière, 1889, 181).

[13] The *Aperçu* had originally been written as a response to a prize question posed in 1829 by the Belgian Academy of Sciences which asked for "a philosophical examination of the different methods in modern geometry, particularly the method of reciprocal polars." Chasles was awarded the prize in 1830, an extended version was finally printed in Brussels in 1837 (Koppelman, 1971, 213).

115). In a footnote, Chasles says that he is stating the opinion of Joseph-Diez Gergonne (1771–1859). According to Chasles, Gergonne, the well-known co-inventor (together with Poncelet) of duality in projective geometry and founder of the *Annales de mathématiques pures et appliquées* (1810), had expressed this opinion in a letter to the Belgian astronomer and statistician Adolphe Quetelet (1796–1874) who then had published it in a Belgian journal in a paper on mathematical optics (Quetelet, 1827).

Chasles's indirect quote of Gergonne through Quetelet largely coincides with what Rebière reproduces, but, even allowing for translation, it does differ quite a bit from what Smith says in 1873. However, the reference to completing a "theory" and explaining it to a "passer-by (man) on the street" are in all three quotes thus convincing us of their shared origin.

So there was no longer any doubt about the identity of the "old French mathematician" and, frankly, we felt a bit disappointed. Many readers before us must have seen the allusion by Chasles in his famous book. Indeed Chemla, in her forthcoming work on Chasles's historiography of geometry, includes Gergonne's 'man on the street' quote, and she also shares our opinion on the quote's broader philosophical meaning.[14] Other Gergonne scholars must have been aware of it.[15] And in Dirk Struik's biography of Gergonne in the *Dictionary of Scientific Biography* we subsequently found Gergonne's quote as the concluding remark, with the exact reference to Chasles as the source. The quote is also in the Gergonne biography on the MacTutor website, apparently drawing on Struik. However, neither Struik, nor the authors J.J. O'Connor and E.F. Robertson of the website article, refer to Hilbert in this context.

Indeed we took comfort from the fact that apparently no historian had connected the two mathematicians, Gergonne and Hilbert, with respect to this quote. Yet there are many connections between the two men in mathematical and philosophical respects. Chasles introduced his references to Gergonne's "man on the street" quote with the remark that Gergonne was one of the "modern geometers who have most reflected on the philosophy of mathematics"[16] and Chasles continued after the quote with the following words:

[14] See (Chemla, to appear). In a personal communication to one of us, she writes on 6 October 2015: "C'est en fait un idéal très important pour Chasles, et j'essaie de l'expliquer dans l'article. Pour moi, il est assez clair que Hilbert renvoie à Chasles ou à Gergonne, sans doute plutôt à Gergonne: l'idéal de Gergonne a été souvent repris."

[15] Nevertheless, it is not mentioned in Dahan (1986), Lafon (1860), or Otero (1997).

[16] "un des géomètres modernes qui ont le plus médité sur la philosophie des mathématiques." For Gergonne's philosophical and didactical views, see Dahan (1986).

> And, in effect, great and original truths, from which all others derive, and which are the true foundations of science, always have the characteristic attributes of simplicity and intuition.[17]

This is of course very much reminiscent of the axiomatic spirit of Hilbert's geometry three-quarters of a century later. As to the concrete influence of Gergonne's specialty, projective geometry, we know that it was one of the most important sources of Hilbert's *Grundlagen der Geometrie* (1899).[18]

While the discussion between Gergonne and Quetelet, as documented in (Quetelet 1827), is not exactly about projective geometry but about mathematical optics, the spirit of the "man on the street" quote seems to apply to both fields. Quetelet explains in his paper that Gergonne had used this quote to congratulate him on "reducing catoptrics and dioptrics" (Quetelet, 1827, 88) to such simple principles as demanded in the quote. Quetelet, on his part, used the occasion to applaud Gergonne for similar, simplifying efforts in mathematical optics.[19] Atzema, in his impressive analysis of Quetelet's and Gergonne's contributions to mathematical optics, comes to the following conclusion:

> According to Gergonne, it was not the task of the modern mathematician to find new facts, but rather to relate known theories to one another and to reduce the corpus of knowledge to its basic components. In taking this stance … Gergonne was certainly not unique among (French) mathematicians of the first half of the 19th century. (Atzema, 1995, 353)

Looking for further sources documenting Gergonne's philosophy of science and mathematics we were led to two texts written by Gergonne in the years 1809 and 1813 respectively, namely on "On method in the sciences in general and in the exact sciences in particular" ("De la méthode dans les sciences en général et en particulier dans les sciences exactes"), and "Methods of synthesis and analysis in mathematics" ("Méthodes de la synthèse et de l'analyse mathématique") (Dahan, 1986). The first text was published only in indirect quotes (Gergonne, 1809), while the second, which was honoured by the Bordeaux Academy, appeared in shortened form as (Gergonne, 1816-1817) and is among the more general of a number of articles published by Gergonne in his *Annales* under the classification 'philosophie mathématique'.[20] Without making any attempt at a full investigation as to how these two texts

[17] "Et en effet, les vérités grandes et primitives, dont toutes les autres dérivent, et qui sont les vraies bases de la science, ont toujours pour attribut caractéristique la simplicité et l'intuition:" (Chasles, 1837, 115).
[18] Toepell (1999).
[19] Quoting from Atzema (1995, 338): "Although initially the investigations were restricted to caustic curves only, Gergonne systematically tried to extend the results to a broader context. The final outcome of this was that a very elegant proof for Malus' theorem was found."
[20] The 1813 manuscript was commented on by Ami Dahan Dalmedico in (Dahan, 1986).

relate to the Gergonne quote about the "first man on the street," [21] we may, however, note that the quote is not contained in either of them. Rather to the contrary, the complicated nature of certain attributes and notions, such as "simplicity" or "existence", is stressed by Gergonne, when he, for instance, insists on the fact that the simplest notions need not be the most familiar to the general public[22] or when he says:

> Not all truths are revealed by direct demonstration; of many objects we do not know what they are, but only what they are not, and such are, for instance, in geometry, curves and incommensurables.[23]

But what is clear from both texts is that Gergonne is very much concerned about the language of mathematics and the relation of the deductive method to the didactics of mathematics, and to broader problems of the dissemination of mathematical knowledge. This of course was also fundamental to Hilbert's efforts 75 years later in his reinvigoration of Euclidean axiomatics, and in his insistence on the guiding role of concrete mathematical problems.

Although Hilbert does not quote Chasles or Gergonne in his *Grundlagen der Geometrie*,[24] he quotes Chasles frequently in other contexts and it is most unlikely that he did not read the *Aperçu* at some point in his career. Not only was the *Aperçu* a locus classicus for work on the foundations of geometry, but in 1839 it was published in German translation, where Chasles's reference to the "man on the street quote" is easily found.[25] It is even possible that Hilbert had seen the quote there first and reading Smith (1873) not only reminded him but had an affirmative and re-enforcing effect on him. With regard to Smith, it is most likely that he had read Chasles's remark in the *Aperçu*, since he refers to the *Aperçu* several times in his early geometrical work (Smith 1852, 29 and 32).

What is indubitable, however, is that Hilbert took the wording from Smith, because of the differences between Chasles's/Rebière's and Smith's formulations, in particular Smith's introduction of the phrase "old French geometer".

---

[21] This would only be possible in the context of discussing Gergonne's polemics against the French philosopher E.B. de Condillac, which are central in Gergonne's 1813 text. (Dahan, 1986)

[22] "Les idées et les expressions les plus simples ne sont pas toujours, en effet, les plus familières au vulgaire." (Gergonne, 1809, 235)

[23] "Toutes les vérités ne sont pas susceptibles d'une démonstration directe ; nous savons de beaucoup d'objets, non pas ce qu'ils sont, mais seulement ce qu'ils ne sont pas; et telles sont, par exemple, en géométrie, les lignes courbes et les incommensurables." (Gergonne, 1809, 240)

[24] Hilbert refers there mainly to older French geometers such as Desargues and Pascal. Browsing the three volumes of Hilbert's *Gesammelte Abhandlungen* (1932–1935), we did not find a single reference by Hilbert to Gergonne.

[25] Chasles (1839, 112): "dass man sich nicht schmeicheln darf, mit einer Theorie vollständig fertig zu sein, so lange man nicht im Stande ist, dieselbe Einem auf der Strasse in wenigen Worten zu expliciren."

These differences, together with the fact that when we checked Quetelet's publication (1827) we found that Chasles had not quoted him correctly, stimulated us to search for the original of Gergonne's letter to Quetelet, which must have been written in or before1827. Quetelet had quoted from Gergonne's letter in the following manner:

> For many years I repeated to my students, he wrote to me, that one does not yet have the last word of science on a theory for as long as one has not brought it to the point of being able to recount it to a passer-by on the street.[26]

This Chasles had replaced by

> One cannot flatter oneself that one has the last word of a theory until one can explain it in a few words to a passer-by on the street.[27]

He adds "flatter" (cajole, flatter) and "peu de paroles" (few words) to Quetelet's quote, and Rebière, quoting from Chasles, repeats this, replacing "paroles" by the almost equivalent "mots", and adding more words about "clarifying and reducing" the theory. As is customary in English, Smith had replaced "passer-by" by "first man." (Although Smith, like Quetelet, does not stipulate that the theory should be explainable in a "few words", we have no reason to think that Smith read the more obscure paper by Quetelet from which Chasles quotes freely.)

To be sure, none of these changes alters very much the spirit of the quote. But still our desire grew to see the original of the letter which Gergonne had written to Quetelet. The obvious place to look was the Archives of the Belgian Academy of Sciences, where Quetelet's extensive correspondence is held.

Fortunately there are only five letters extant from Gergonne to Quetelet for the years 1825-1827, and the archivist, Olivier Damme, was kind enough to send us copies of all of them. And here finally was the letter which Gergonne wrote to Quetelet in the context of the latter's investigation of caustics in mathematical optics. The letter is dated Montpellier 25 February 1825 and has on its first page the following (Fig. 1):

> Il y a longtems[28] que je répète à mes élèves qu'on n'a pas encore le dernier mot de la science sur une théorie, tout aussi longtems qu'on ne l'a pas amenée au point de la racconter [sic] à un

[26] "Il y a long-temps que je répète à mes élèves, m'écrivait-il, qu'on n'a pas encore le dernier mot de la science sur une théorie, tout aussi long-temps qu'on ne l'a pas amenée au point de la raconter à un passant, dans la rue." (Quetelet, 1827, 88)

[27] "qu'on ne peut se flatter d'avoir le dernier mot d'une théorie, tant qu'on ne peut pas l'expliquer en peu de paroles à un passant dans la rue." (Chasles, 1837, 115).

[28] As we are kindly informed by Catherine Goldstein, this is old French for "longtemps."

passant, dans la rue.[29]

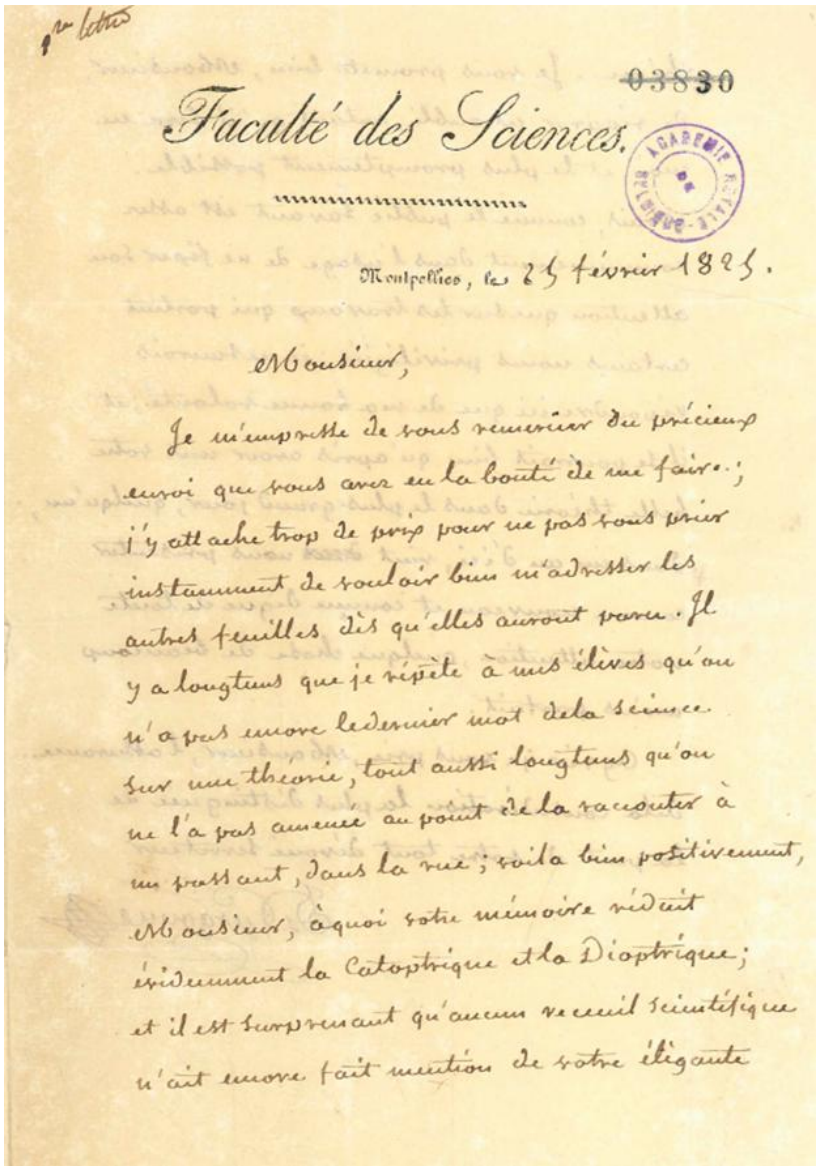


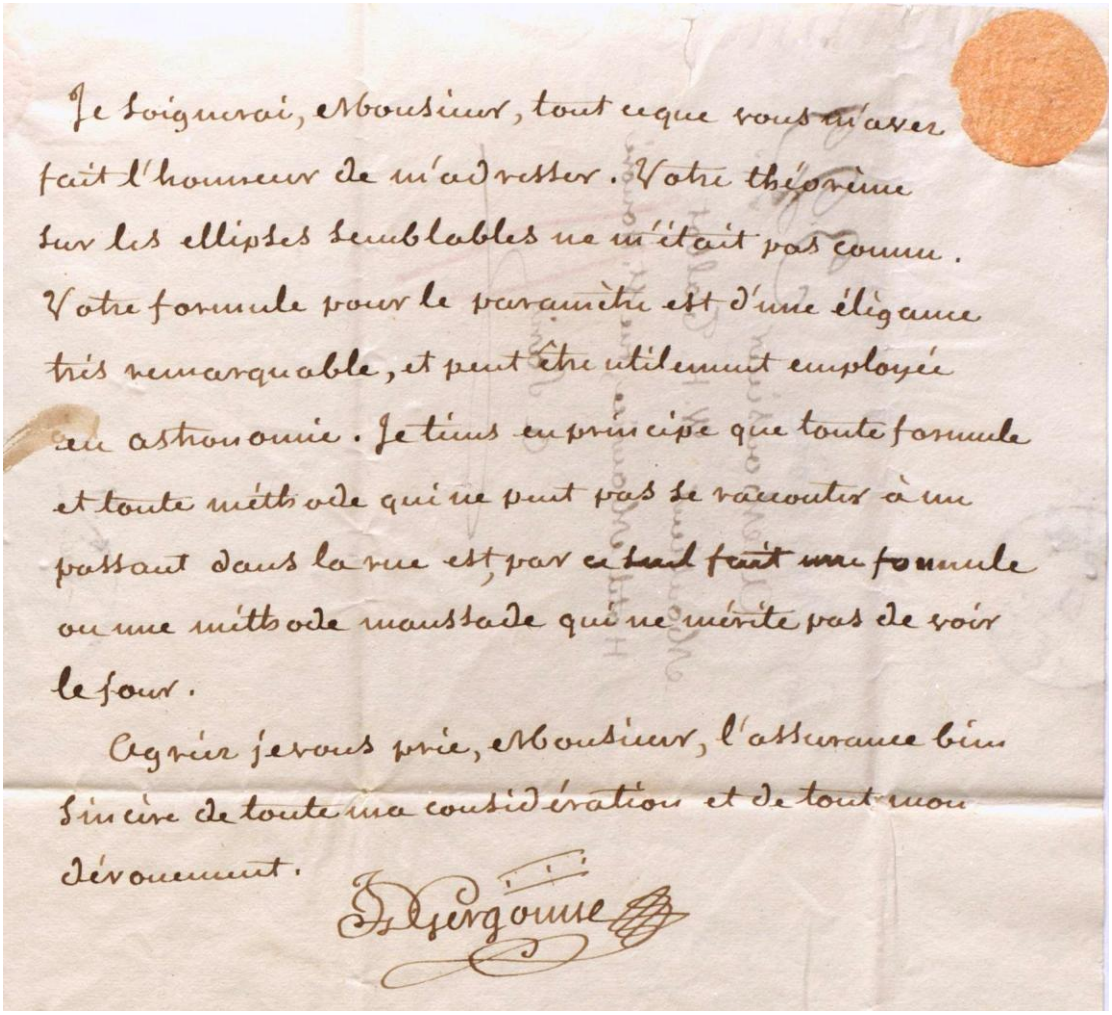
Fig. 1. Letter from J.D. Gergonne to L.A.J. Quetelet, 25 February 1825. [Académie royale des Sciences, des Lettres et des Beaux-Arts de Belgique. Archive Number 17986/1125]

Thus we saw that Quetelet was conscientious with quoting while Chasles was not. Since Gergonne claimed that he had repeated his conviction to his students, we looked for further reference to it in Gergonne's works and in biographies but without success.[30]

[29] The quotation is given in French so that the linguistic differences from the Quetelet quote above can be seen. Académie royale des Sciences, des Lettres et des Beaux-Arts de Belgique, archives, nr. 17986/1125.
[30] Since Gergonne's papers have not been collected together, our search was largely confined to publications in Gergonne's *Annales* together with those listed in (Otero, 1997).

However, we did find a closely related reference to it in Gergonne's correspondence with William Henry Fox Talbot (1800-1877). Talbot, today famous for his pioneering work in photography, was twelfth wrangler in the Cambridge Tripos of 1820. He had met Gergonne in the spring of 1822 while travelling in the south of France,[31] and between 1822 and 1824 Talbot published several notes in Gergonne's *Annales*. In 1826 Gergonne wrote to him to solicit further manuscripts (Fig. 2):

> I shall take great care, Sir, over everything you have done me the honour of sending me. … I hold to the principle that any formula and any method which cannot be explained to a passer-by is, by dint of this very fact, a dull formula or method which does not deserve to see the light of day.[32]


Je soignerai, Monsieur, tout ce que vous m'avez fait l'honneur de m'adresser. Votre théorème sur les ellipses semblables ne m'était pas connu. Votre formule pour le paramètre est d'une élégance très remarquable, et peut être utilement employée en astronomie. Je tiens en principe que toute formule et toute méthode qui ne peut pas se raconter à un passant dans la rue est, par ce seul fait une formule ou une méthode maussade qui ne mérite pas de voir le jour.

Agréez je vous prie, Monsieur, l'assurance bien sincère de toute ma considération et de tout mon dévouement.

J. D. Gergonne

[31] See (Barrow-Green, 2013, 74–76) for a discussion of Fox Talbot's relationship with Gergonne.

[32] "Je soignerai, Monsieur, tout ce que vous m'avez fait l'honneur de m'adresser. .... Je tiens au principe que toute formule et toute méthode qui ne peut pas se raconter à un passant dans la rue est, par ce seul fait une formule ou une méthode maussade qui ne mérite pas de voir le jour." Letter from J.-D. Gergonne to W.H. Fox Talbot, 16 December 1826. The British Library, Add MS 88942/2/60. The Fox Talbot correspondence is on line at http://foxtalbot.dmu.ac.uk/.

Fig. 2. Letter from J.D. Gergonne to W.H Fox Talbot, 26 December 1826. [© The British Library Board, Add MS 88942/2/60]

Although Gergonne did not formulate his dictum in the same way for Talbot as for Quetelet – dullness is not the same as incompleteness – the sentiment is comparable. However, despite revealing his modus operandi, Gergonne's solicitation to Talbot came to nothing. Talbot thought Gergonne had been taking too many liberties in his role as editor, altering articles, etc., and he, Talbot, discontinued the correspondence.[33]

Talbot's misgivings about Gergonne as an editor were not misplaced. Gergonne alone determined the content of his *Annales* and he seems to have had little or no qualms about heavily editing submissions to suit his research agenda. Here again we can see a connection between the roles of Gergonne and Hilbert in the mathematical community. In Gergonne's case there is the propensity to 'over-edit' submissions to his journal, whereas in Hilbert's case there is the well-known process of Göttingen 'nostrification', as well as his dominating position as editor of *Mathematische Annalen*. Both men, due to their influential positions, had the means to direct the research of young mathematicians through providing questions and outlets for their publications.

Finally, we were struck by some remarks in another letter from Gergonne to Quetelet which we found while searching for the quote. They seemed to us too impressive not to share with our readers, and they will conclude our paper. We only remark that Gergonne's belief in the international character of mathematics foreshadows that of Hilbert's almost one hundred years later.[34] Gergonne wrote to Quetelet on 9 June 1825 (see Fig. 3):

> I see with pleasure, Monsieur, and without any jealousy, that the studies of the students at your schools are much stronger than those of the students at ours. I speak without jealousy and let me explain: to be sure I wish with all my heart that our students were stronger; but I would be very sorry to see yours weaker; and that is because I do not possess that national egotism that one usually decorates with the beautiful name of patriotism. What matters most to me is that the light comes to us; and I am very little interested in the direction from which it comes.[35]

[33] See (Barrow-Green, 2013, 75) and (Atzema 1995, 338).
[34] See (Siegmund-Schultze, 2016).
[35] "Je vois avec plaisir, Monsieur, et sans jalousie aucune, que les études des élèves de vos écoles sont beaucoup plus fortes que celles des élèves des notres. Je dis sans jalousie et je m'explique: je voudrais certes de très grand cœur que nos élèves fussent plus forts; mais je serais très faché de voir les votres plus faibles; et cela parceque [sic] je ne suis pas possédé de cet égoisme national qu'on décore du beau nom de patriotisme. Ce qui m'importe surtout c'est que la lumière nous arrive; et je m'interesse assez peu alors de quel côté elle part." Académie royale des Sciences, des Lettres et des Beaux-Arts de Belgique, archives, nr. 17986/1125.

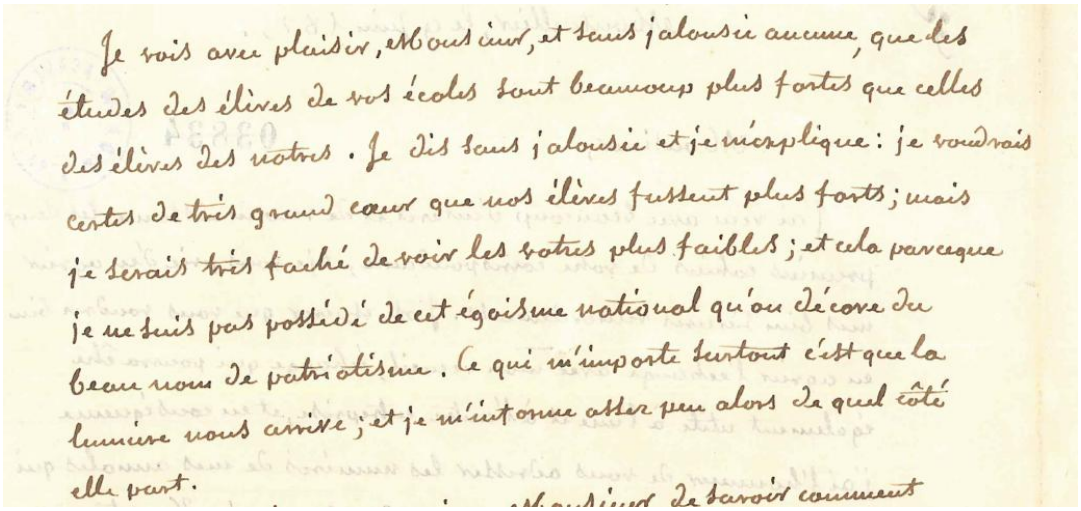

Je vois avec plaisir, et sans jalousie aucune, que les études des élèves de vos écoles sont beaucoup plus fortes que celles des élèves des nôtres. Je dis sans jalousie et je m'explique: je voudrais certes de très grand cœur que nos élèves fussent plus forts; mais je serais très fâché de voir les vôtres plus faibles; et cela parceque je ne suis pas possédé de cet égoïsme national qu'on décore du beau nom de patriotisme. Ce qui m'importe surtout c'est que la lumière nous arrive; et je m'inquiète assez peu alors de quel côté elle part.

Fig. 3. Extract from a letter from J. D. Gergonne to L.A.J. Quetelet, 9 June 1825. [Académie royale des Sciences, des Lettres et des Beaux-Arts de Belgique. Archive Number 17986/1125.]

References

Atzema, E.J., 1995. A Theory of Caustics –The Contribution of Dupin, Quetelet and Gergonne to Geometrical Optics. In: von Gotstedter, A. (Ed.), *Ad Radices.* Franz Steiner, Stuttgart, 331–354.

Barrow-Green, J., 2013. "Merely a speculation of the Mind"? William Henry Fox Talbot and Mathematics. In Brusius, M., Dean, K., Ramalingam, C. (Eds.), *William Henry Fox Talbot. Beyond Photography*, The Yale Center for British Art, New Haven, 67–94.

Bell, E.T., 1937. *Men of Mathematics.* Simon and Schuster, New York.

Carlson, J., Jaffe, A., Wiles, A., 2006. *The Millennium Prize Problems*. Cambridge: Clay Mathematics Institute. American Mathematical Society, Providence.

Chasles, M., 1837. *Aperçu historique sur l'origine et le développement des méthodes en géométrie*. M. Hayez, Brussels.

Chasles, M.,1839. *Geschichte der Geometrie, hauptsächlich mit Bezug auf die neueren Methoden*. Gebauer, Halle (German translation by L.A. Sohncke).

Chemla, K., to appear. The Value of Generality in Michel Chasles's Historiography of Geometry (38pp.).

Crilly, T., 2006. *Arthur Cayley. Mathematician Laureate of the Victorian Age*. The Johns Hopkins University Press, Baltimore.

Dahan, A., 1986. Un texte de philosophie mathématique de Gergonne (Mémoire inédit déposé à l'Académie de Bordeaux). *Revue d'histoire des sciences* 39, 97–126.

Gergonne, J.-D., 1809. De la méthode dans les sciences en général et en particulier dans les sciences exactes. *Notices des Travaux de l'Académie du Gard* (1810), 210–281, reproduced in Otero (1997), 227–250.

Gergonne, J.-D., 1816-1817. De l'analise et de la synthèse, dans les sciences mathématiques. *Annales de mathématiques pures et appliquées* 7, 345–372.

Grattan-Guinness, I., 2000. A Sideways Look at Hilbert's Twenty-three Problems of 1900. *Notices of the American Mathematical Society* 47, 752–757.

Gray, J., 2000. *The Hilbert Challenge*. Oxford University Press, Oxford.

Hannabuss, K., 2000. Henry Smith. In: Fauvel, J., Flood, R., Wilson, R. (Eds.), *Oxford Figures*, Oxford University Press, Oxford, 202–217.

Hilbert, D., 1900. Mathematische Probleme. Vortrag, gehalten auf dem internationalen Mathematiker-Kongreß zu Paris 1900. Nachrichten von der Gesellschaft der Wissenschaften zu Göttingen, Physikalisch-Mathematische Klasse, 253–297.

Hilbert, D., 2000. Mathematical Problems. *Bulletin of the American Mathematical Society* 37, 407–436 (reprint from *Bulletin of the American Mathematical Society* 8 (1902), 437–479. tr. M.F. Winston).

Koppelman, E., 1971. Michel Chasles. In: C.G. Gillispie, C.G. (Ed.), *Dictionary of Scientific Biography*, III. Charles Scribner's Sons, New York, 212–215.

Lafon, A., 1860. Gergonne: sa vie et ses travaux. *Mémoires Soc. Royal Nancy* 23, xxv–lxxiv.

Minkowski, H., 1973. *Briefe an David Hilbert*. Springer, New York.

Moritz, R.E., 1914. *Memorabilia Mathematica. The Philomath's Quotation Book*. Macmillan, New York. (Republished as *On Mathematics and Mathematicians*. Dover, New York, 1958.)

Otero, M.H., 1997. Joseph-Diez Gergonne (1771–1859). Histoire et philosophie des sciences, *Sciences et Techniques en Perspective* 37. Université de Nantes.

Petzold, C., 2005. Maxwell, Molecules, and Evolution. http://www.charlespetzold.com/etc/MaxwellMoleculesAndEvolution.html. Accessed 29 July, 2016.

Quetelet, A., 1827. Résumé d'une nouvelle théorie des caustiques, suivi de différentes applications à la théorie des projections stéréographiques. *Nouveaux Mémoires de l'Académie Royale des Sciences de Bruxelles* 4, 81–113.

Rebière, A., 1889. *Mathématiques et mathématiciens: pensées et curiosités*. Librairie Nony, Paris.

Rowe, D.E., 2015. Historical Background of Hilbert's Seventh Paris Problem. In: Rowe, D.E., Horng, W.E., (Eds.), *A Delicate Balance: Global Perspectives on Innovation and Tradition in the History of Mathematics*. Birkhäuser/Springer, Berlin, 211–244.

Siegmund-Schultze, R., 2016. "Mathematics knows no races": A political speech that David Hilbert planned for the ICM in Bologna in 1928. *The Mathematical Intelligencer* 38, no.1, 56–66.

Smith, H.J.S., 1894. *Collected Mathematical Papers*, Glaisher, J.W.L. (Ed.), 2 volumes. Clarendon Press, Oxford.

Smith, H.J.S., 1852. On some geometrical constructions. Republished in Smith (1894), volume I, 24–32.

Smith, H.J.S., 1873. Address to the Mathematical and Physical Section of the British Association. Republished in Smith (1894), volume II, 681–690.

Smith, H.J.S., 1876. On the Present State and Prospects of Some Branches of Pure Mathematics. Republished in Smith (1894), volume II, 166–190.

Struik, D.J., 1972. Joseph Diaz Gergonne. *Dictionary of Scientific Biography* 5, 367–369.

Thiele, R., 2005. Hilbert and his Twenty-Four Problems. In: G. Van Brummelen, G., Kinyon, M. (Eds.), *Mathematics and the Historians' Craft*. Springer, New York, 243–295.

Toepell, M, 1999. Die projektive Geometrie als Forschungsgrundlage David Hilberts. In: Hilbert, D., *Grundlagen der Geometrie*, 14th edition, Toepell, M. (Ed.). Teubner, Stuttgart and Leipzig, 347–361.

Yandell, B.H., 2002. *The Honors Class. Hilbert's Problems and Their Solvers*. A.K. Peters, Natick.

***Biographical Sketch**

June Barrow-Green is Professor of History of Mathematics at the Open University. Her main area of research is in the history of mathematics of the 19th and early 20th century, and she has recently finished a study on the role of British mathematicians in the First World War. She is the co-author, with Reinhard Siegmund-Schultze, of "The History of Applied Mathematics" in *The Princeton Companion to Applied Mathematics* (2015).

Reinhard Siegmund-Schultze is Professor of History of Mathematics at the University of Agder in Kristiansand (Norway). He has recently been working on a scientific biography of Richard von Mises. His most recent book is Mathematicians Fleeing from Nazi Germany (Princeton University Press 2009). He is the co-author, with June Barrow-Green, of "The History of Applied Mathematics" in *The Princeton Companion to Applied Mathematics* (2015).

***LaTeX Source Files**

Click here to download LaTeX Source Files: Gergonne 4.tex